

(19) World Intellectual Property  
Organization  
International Bureau



(43) International Publication Date  
2 December 2004 (02.12.2004)

PCT

(10) International Publication Number  
**WO 2004/103635 A1**

(51) International Patent Classification<sup>7</sup>: B23Q 7/16

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(21) International Application Number:

PCT/FI2004/050054

(22) International Filing Date: 4 May 2004 (04.05.2004)

(25) Filing Language: English

(26) Publication Language: English

(30) Priority Data:  
20035070 22 May 2003 (22.05.2003) FI

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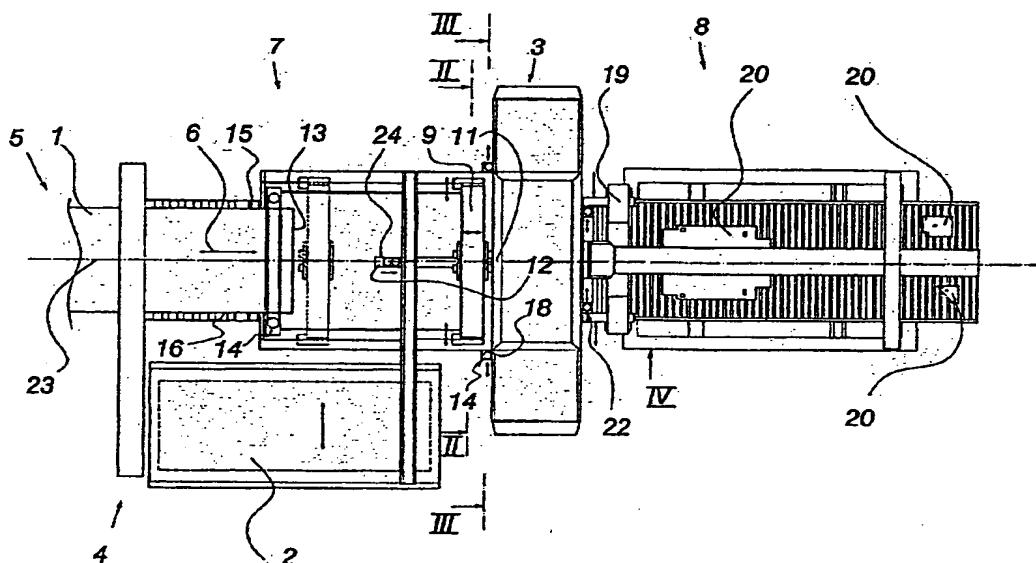
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(81) Designated States (unless otherwise indicated, for every kind of national protection available): AE, AG, AL, AM, AT, AU, AZ, BA, BB, BG, BR, BW, BY, BZ, CA, CH, CN, CO, CR, CU, CZ, DE, DK, DM, DZ, EC, EE, EG, ES, FI, GB, GD, GE, GH, GM, HR, HU, ID, IL, IN, IS, JP, KE, KG, KP, KR, KZ, LC, LK, LR, LS, LT, LU, LV, MA, MD, MG, MK, MN, MW, MX, MZ, NA, NI, NO, NZ, OM, PG, PH, PL, PT, RO, RU, SC, SD, SE, SG, SK, SL, SY, TJ, TM, TN, TR, TT, TZ, UA, UG, US, UZ, VC, VN, YU, ZA, ZM, ZW.

(84) Designated States (unless otherwise indicated, for every kind of regional protection available): ARIPO (BW, GH, GM, KE, LS, MW, MZ, NA, SD, SL, SZ, TZ, UG, ZM, ZW), Eurasian (AM, AZ, BY, KG, KZ, MD, RU, TJ, TM), European (AT, BE, BG, CH, CY, CZ, DE, DK, EE, ES, FI, FR, GB, GR, HU, IE, IT, LU, MC, NL, PL, PT, RO, SE, SI, SK, TR), OAPI (BF, BJ, CF, CG, CI, CM, GA, GN, GQ, GW, ML, MR, NE, SN, TD, TG).

[Continued on next page]

(54) Title: FEED MECHANISM



(57) Abstract: A feed mechanism for feeding a material (1,2) to be processed into a working assembly (3) included in a sheet processing line, said feed mechanism comprising equipment (4,5) for handling both single sheets (2) and a strip (1) unloaded from a reel, and which equipment optionally provides a guidance either for the single sheets (2) or the strip (1) onto an entry track (6) to the working assembly (3). The feed mechanism comprises at least one web guide (14,22), a first feeder (9), a barrier (11) for determining the position for a leading edge (13) of the single sheet (2) or the strip (1), a feeding means (12) for bringing the leading edge (13) of the single sheet (2) or the strip (1) against said barrier (11), at least one arrest cylinder (18) for immobilizing the processed single sheet (2) or strip (1) relative to the entry track (6), a second feeder (19).



**Published:**

— with international search report

*For two-letter codes and other abbreviations, refer to the "Guidance Notes on Codes and Abbreviations" appearing at the beginning of each regular issue of the PCT Gazette.*

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10/550186

JC17 Rec'd PCT/PTO 21 SEP 2005

## Description

### FEED MECHANISM

- [001] The invention relates to a feed mechanism for feeding a material to be processed into a working assembly included in a sheet processing line, said feed mechanism comprising equipment for handling both single sheets and a strip unloaded from a reel, and which equipment optionally provides a guidance either for the single sheets or the strip onto an entry track to the working assembly.
- [002] In sheet processing lines known from the prior art, the material to be processed is fed to a working assembly present in the sheet processing line either in the form of single sheets or a strip to be unloaded from a reel. Switching over from strip material to single sheet material or reversely from single sheet material to strip material is not generally possible, or at least it is highly inconvenient. Production of large series from a strip material is advantageous, fast, and efficient. On the other hand, it is generally preferred to manufacture individual pieces and small series from a single sheet material. Integration of these production modes enhances the efficiency, flexibility and rate of production, thus resulting in cost savings, shorter times per unit, increase in productivity, and a more customized production environment.
- [003] It is an object of the invention to provide a feed mechanism of the foregoing type, which enables a change-over quickly and in a simple manner to the use of a material, in other words a strip or single sheets, whichever is most useful with regard to a particular product to be manufactured.
- [004] This object is fulfilled by means of a feed mechanism of the invention, the characterizing features of which are set forth in the characterizing clause of claim 1.
- [005] Preferred evolutions of the invention are disclosed in the dependent claims.
- [006] The invention will now be described in more detail with reference to the accompanying drawings, in which:  
Fig. 1 shows a feed mechanism of the invention in a schematic plan view.  
Fig. 2 shows a section along a line II-II in fig. 1.  
Fig. 3 shows a section along a line III-III in fig. 1.  
Fig. 4 shows a side view at an arrow IV in fig. 1.  
Fig. 5 shows a section along a line V-V in fig. 4.
- [007] Fig. 1 shows in a schematic plan view a portion of a sheet processing line, including a working assembly indicated by reference numeral 3. The working assembly 3 has its tools preferably adapted to travel crosswise relative to the lengthwise direction of the sheet processing line. In principle, however, the working assembly 3 can be any type of assembly adaptable to sheet working. The sheet processing line has its entry track, designated with reference numeral 6, supplied either with a strip 1 unloaded from a

reel (not shown) by means of schematically illustrated equipment generally designated with reference numeral 5 or optionally with single sheets 2 by means of equipment generally designated with reference numeral 4, said equipment 4 picking up one single sheet 2 at a time from an appropriate stack onto the processing line entry track 6.

- [008] On the entry track 6, the subsequently processed strip 1 or single sheets 2 travel from left to right in fig. 1, the section of the working assembly to the left of the working assembly 3 being hereinafter referred to as an entry side 7 and the section to the right thereof as an exit side 8.
- [009] On its entry side 7, the working assembly 3 has the entry track 6 provided on either side thereof with at least one web guide 14 for guiding sides 15, 16 of the single sheet 2 or the strip 1 which are parallel to the entry track 6. In the example of fig. 1, the entry track 6 is provided on either side thereof with two web guides 14. At least one of the web guides 14 is equipped with a positioning element 17 (fig. 3) for shifting the single sheet 2 or the strip 1 to a desired position in a direction crosswise to the entry track's 6 lengthwise direction.
- [010] The web guides 14 on the other side can be stationary, yet preferably arranged according to fig. 3 in such a way that the web guides 14 present on the opposite sides 15, 16 are adapted to center or align the single sheet 2 or the strip 1 relative to a longitudinal center line 23 of the entry track 6. In the example of fig. 3, this is implemented by means of ball screws making up the positioning element 17.
- [011] On its exit side 8 as well, the working assembly 3 has the entry track 6 provided on either side thereof with at least one web guide 22. The web guide 22 is preferably as shown in fig. 3 and thus identical to the web guide 14 mounted on the entry side 7 of the working assembly 3.
- [012] The working assembly 3 has its entry side 7 provided with a first feeder 9 shuttling co-directionally with the entry track 6 and mounted above the entry track 6. The feeder 9 is equipped with grippers 25 (fig. 2), which take hold of the opposite sides 15, 16 of the single sheet 2 or the strip 1 and which are adapted to move a positioning element 10, a ball nut screw in the example of fig. 2, for shifting the single sheet 2 or the strip 1 to a desired position in a direction crosswise to the direction of the entry track 6.
- [013] In the illustrated example, the feeder 9 has its positioning element 10 adapted to center or align the single sheet 2 or the strip 1 relative to the longitudinal center line 23 of the entry track 6.
- [014] In view of determining the position for a leading edge 13 of the single sheet 2 or the strip 1, the entry track 6 is provided, preferably on the entry side 7 of the working assembly 3, with a barrier 11 which most preferably comprises a vertically movable rod or bar.
- [015] The working assembly 3 has its entry side 7 provided with a separate feeding means

12 for bringing the leading edge 13 of the single sheet 2 or the strip 1 against said barrier 11. The feeding means 12 includes a flexible element 24 for urging said leading edge 13 tightly against the barrier 11. The flexible element comprises preferably a suction pad 24, a magnet or the like engagement element, functioning as a gripper element of the feeding means 12. The feeding means 12 is preferably adapted to operate underneath the single sheet 2 or the strip 1.

- [016] The separate feeding means 12 is needed particularly for setting the single sheets 2 picked up from a stack precisely at a correct location on the entry track 6.
- [017] The working assembly 3 has its entry side provided with an arrest cylinder 18 for immobilizing the subsequently processed single sheet 2 or strip 1 relative to the entry track 6, especially when the first feeder 9 performs a return motion to its start position. The arrest cylinder 18 is preferably integrated with the web guide 14 (fig. 3).
- [018] The working assembly has its exit side 8 provided with a second feeder 19 adapted to shuttle parallel to the entry track 6. The feeder 19 is equipped with a gripper 21, which takes hold of the leading or side edge 13, 15, 16 of the single sheet 2 or the strip 1 or a piece 20 to be removed from the single sheet 2 or the strip 1. In the example of fig. 5, the number of grippers 21 is two. The gripper or grippers 21 is/are adapted to travel in a direction crosswise to the direction of the entry track 6. The gripper/grippers is/are further adapted to travel in a vertical direction. In addition, the grippers 21 are adapted to perform vertical motions thereof independently of each other. This enables the pieces 20 removed from the single sheet 2 or the strip 1 to be carried by the gripper 21 one at a time to a desired location on a conveyor 26 present on the working assembly's 3 exit side 8 without the second gripper, presently in a high position, hampering for example a feeding motion of the strip 1.
- [019] The working assembly 3 has its exit side 8 provided with the arrest cylinder 18 for immobilizing the processed single sheet 2 or strip 1 relative to the entry track 6. The arrest cylinder 18 is most preferably included in the web guide 22.
- [020] The working assembly 3 has its exit side 8 provided with a first conveyor 26, extending parallel to the entry track's 6 plane, and with a second conveyor 27 therebelow. Further provided is an adjustable guide element 28, which in the example of fig. 4 comprises an adjustable baffle, for guiding the pieces 20 removed from the strip 1 or the single sheet 2 onto the desired conveyor 26, 27.
- [021] The feed mechanism operates as follows.
- [022] The entry track is supplied with a strip 1 by means of conventional equipment 5 or optionally with a single sheet 2 by means of conventional equipment 4. The strip 1 or the single sheet 2 is set in a desired position in a direction crosswise to the entry track 6 by means of web guides 14 present on the entry side 7 of a working assembly 3. This is followed by bringing a leading edge 13 of the strip 1 or the single sheet 2 against a

barrier 11, most preferably by the action of a feeding means 12 operating underneath the entry track 6 and equipped for example with suction pads 24. When the strip 1 or the single sheet 2 has its leading edge 13 bearing tightly against the barrier 11, the strip 1 or the single sheet 2 is immobilized by means of arrest cylinders 18 present on the working assembly's 3 entry side 7, whereby a first feeder 9 travels to the left in fig. 1 to its dash-line indicated extreme position and takes hold of the strip 1 or the single sheet 2 and advances the same in a programmed fashion into the working assembly 3. Once the first feeder 9 has reached its right-hand extreme position indicated by solid lines in fig. 1, a second feeder 19 mounted on the working assembly's 3 exit side 8 takes hold of the strip 1 or the web 2 and pulls a trailing end of the strip 1 or the web 2 out of the working assembly 3.

**Claims**

1. A feed mechanism for feeding a material (1, 2) to be processed into a working assembly (3) included in a sheet processing line, said feed mechanism comprising equipment (4, 5) for handling both single sheets (2) and a strip (1) unloaded from a reel, and which equipment optionally provides a guidance either for the single sheets (2) or the strip (1) onto an entry track (6) to the working assembly (3),  
**characterized** in that the feed mechanism comprises  
at least one web guide (14) provided on an entry side (7) of the working assembly (3) on either side of the entry track (6) for guiding sides (15, 16) of the single sheet (2) or the strip (1) which are parallel to the entry track (6), such that at least one of the web guides (14) present on the opposite sides of the single sheet (2) or the strip (1) is equipped with a positioning element (17) for shifting the single sheet (2) or the strip (1) to a desired position in a direction crosswise to the entry track's (6) lengthwise direction,  
a first feeder (9), provided on the working assembly's (3) entry side (7) and shuttling co-directionally with the entry track (6), which is equipped with grippers (25) taking hold of the opposite sides (15, 16) of the single sheet (2) or the strip (1) and being adapted to move by one or more positioning elements (10) for shifting the single sheet (2) or the strip (1) to a desired position in a direction crosswise to the direction of the entry track,  
a barrier (11) for determining the position for a leading edge (13) of the single sheet (2) or the strip (1),  
a feeding means (12) provided on the working assembly's (3) entry side (7) for bringing the leading edge (13) of the single sheet (2) or the strip (1) against said barrier (11),  
at least one arrest cylinder (18) provided on the working assembly's (3) entry side (7) for immobilizing the subsequently processed single sheet (2) or strip (1) relative to the entry track (6),  
at least one web guide (22) provided on either side of the entry track (6) on the working assembly's (3) exit side (8) for guiding the sides (15, 16) of the single sheet (2) or the strip (1) which are parallel to the entry track (6), such that at least one of the web guides (22) present on the opposite sides of the single sheet (2) or the strip (1) is equipped with a positioning element (17) for shifting the single sheet (2) or the strip (1) to a desired position in a direction crosswise to the entry track's (6) lengthwise direction,  
a second feeder (19), provided on the working assembly's (3) exit side (8) and

adapted to shuttle parallel to the entry track (6), which is equipped with a gripper (21) taking hold of the leading or side edge (13, 15, 16) of the single sheet (2) or the strip (1) or a piece (20) to be removed from the single sheet (2) or the strip (1), said gripper being adapted to travel in a direction crosswise to the direction of the entry track (6), and

at least one arrest cylinder (18) provided on the working assembly's (3) exit side (8) for immobilizing the processed single sheet (2) or strip (1) relative to the entry track (6).

2. A feed mechanism as set forth in claim 1, **characterized** in that the first feeder (9) has its positioning element (10) adapted to center the single sheet (2) or the strip (1) relative to a longitudinal center line (23) of the entry track (6).
3. A feed mechanism as set forth in claim 1, **characterized** in that the barrier (11) comprises an immobilizing stopper.
4. A feed mechanism as set forth in claim 1, **characterized** in that the feeding means (12) for bringing the leading edge (13) of the single sheet (2) or the strip (1) against the barrier (11) includes a flexible element (24) for urging said leading edge (13) tightly against the barrier (11).
5. A feed mechanism as set forth in claim 4, **characterized** in that the flexible element comprises a suction pad, a magnet or the like gripper element (24) functioning as a gripper element of the feeding means (12).
6. A feed mechanism as set forth in claim 1, **characterized** in that the web guides (14, 22), provided on the working assembly's (3) entry side (7) and exit side (8) and mounted on the opposite sides (15, 16) of the single sheet (2) or the strip (1), are adapted to center the entry track (6) relative to the longitudinal center line (23).
7. A feed mechanism as set forth in claim 1, **characterized** in that the feeder (19) has its gripper/grippers (21) further adapted to travel in a vertical direction.
8. A feed mechanism as set forth in claim 7, **characterized** in that the grippers (21) are adapted to perform vertical motions thereof independently of each other.
9. A feed mechanism as set forth in claim 1, **characterized** in that the working assembly's (3) exit side (8) is provided with a first conveyor (26), extending parallel to the entry track's (6) plane, and with a second conveyor therebelow, and that further provided is an adjustable guide element (28) for guiding the pieces (20) to be removed from the strip (1) or the single sheet (2) onto the desired conveyor (26, 27).



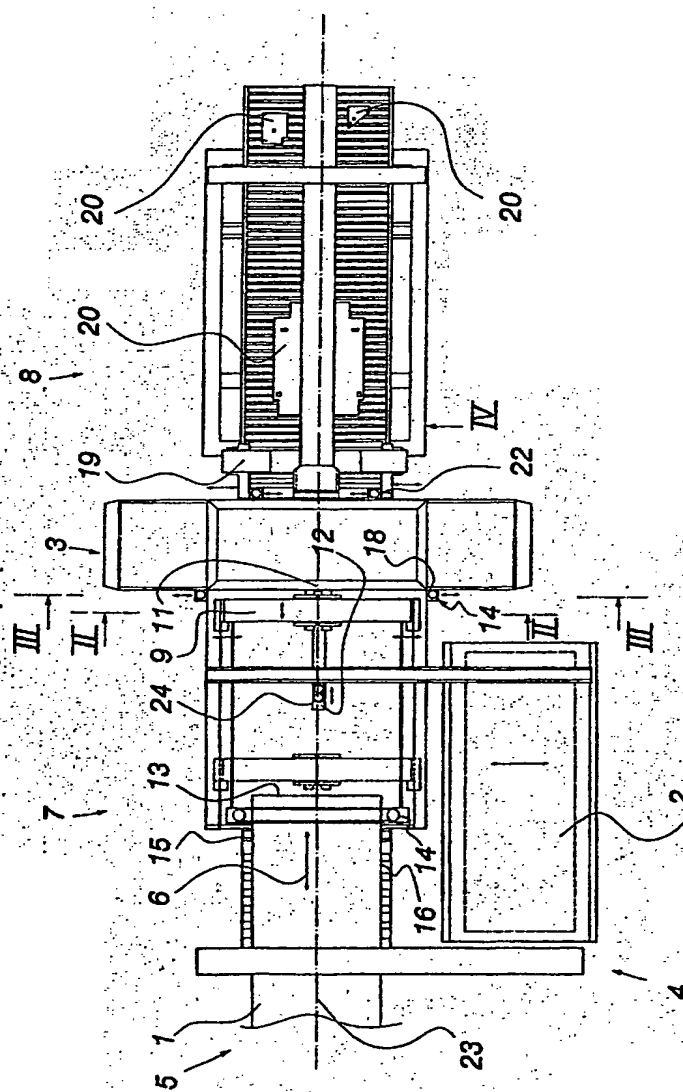


Fig. 1

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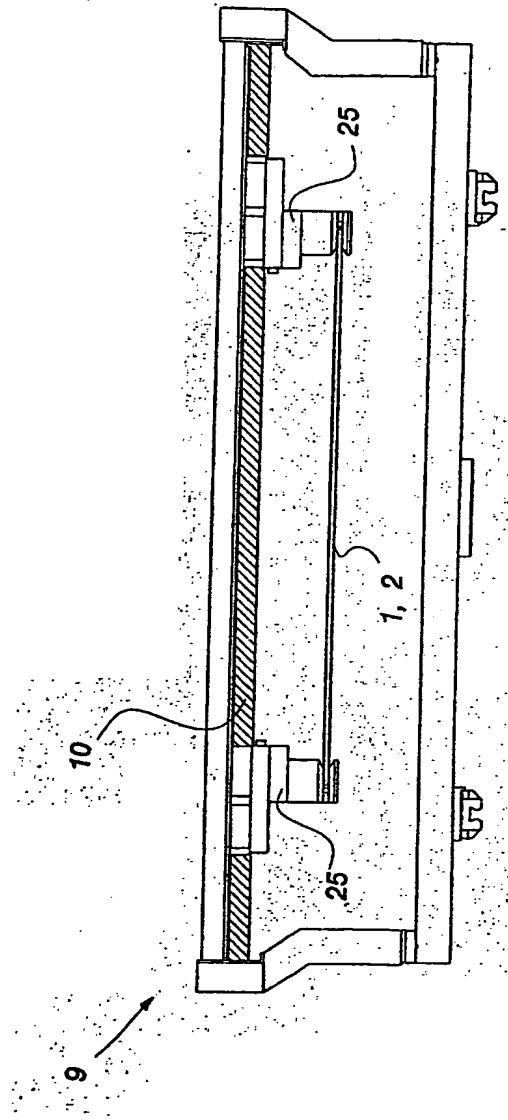


Fig. 2

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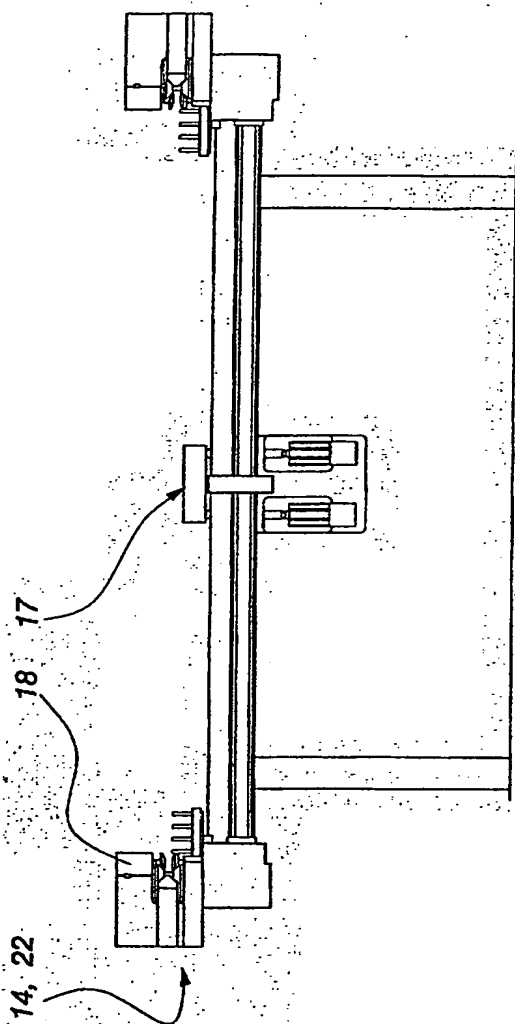


Fig. 3

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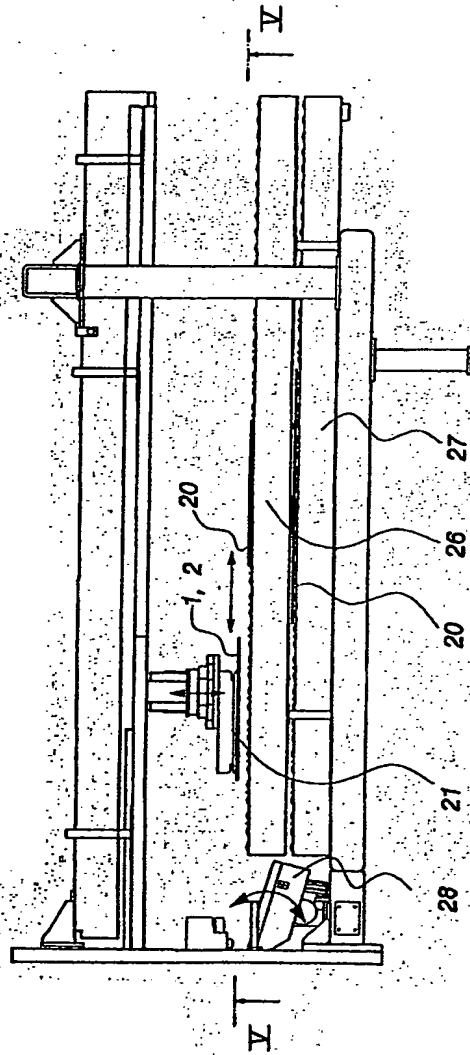


Fig. 4

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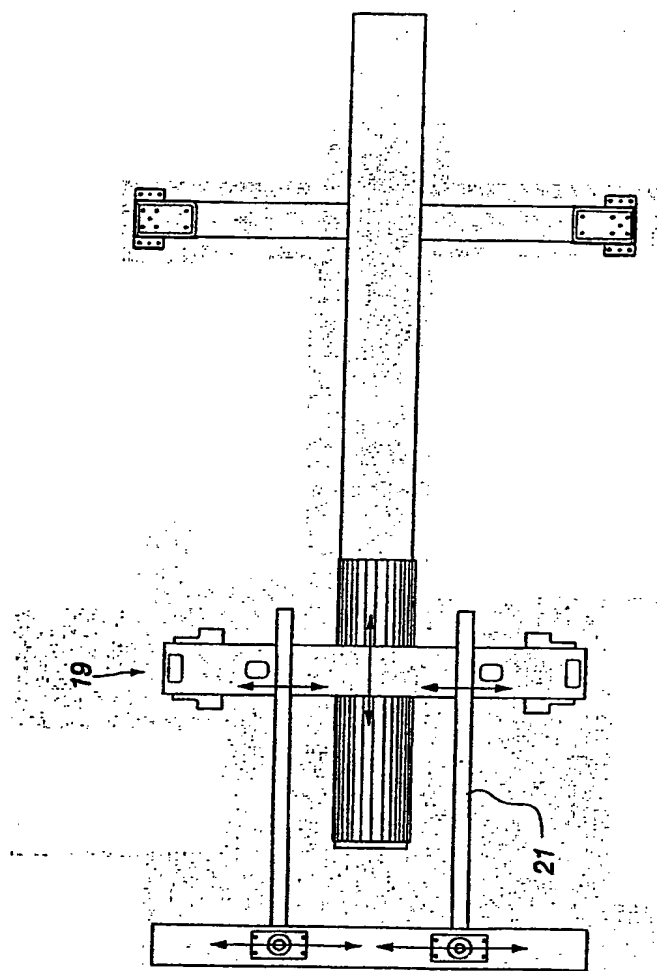


Fig. 5

## INTERNATIONAL SEARCH REPORT

International application No.

PCT/FI 2004/050054

## A. CLASSIFICATION OF SUBJECT MATTER

IPC7: B23Q 7/16

According to International Patent Classification (IPC) or to both national classification and IPC

## B. FIELDS SEARCHED

Minimum documentation searched (classification system followed by classification symbols)

IPC7: B23Q, B65H

Documentation searched other than minimum documentation to the extent that such documents are included in the fields searched

SE,DK,FI,NO classes as above

Electronic data base consulted during the international search (name of data base and, where practicable, search terms used)

EPO-INTERNAL, WPI DATA, PAJ

## C. DOCUMENTS CONSIDERED TO BE RELEVANT

Category*	Citation of document, with indication, where appropriate, of the relevant passages	Relevant to claim No.
A	GB 1114253 A (RONALD JESSE BARDER), 22 May 1968 (22.05.1968) --	1
A	US 2003051526 A1 (JEFFREY VAN CLEAVE ET AL), 20 March 2003 (20.03.2003) -- -----	1

☐ Further documents are listed in the continuation of Box C.☒ See patent family annex.

\* Special categories of cited documents:

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Date of the actual completion of the international search

8 Sept 2004

Date of mailing of the international search report

14 -09- 2004

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# INTERNATIONAL SEARCH REPORT

Information on patent family members

International application No.

PCT/FI 2004/050054

GB	1114253	A	22/05/1968	NONE
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US	2003051526	A1	20/03/2003	NONE
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